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TRASK BRITT
P.O. BOX 2550
SALT LAKE CITY, UT 84110

| EXAMINER |
|---|
| CASCHERA, ANTONIO A |

| ART UNIT | PAPER NUMBER |
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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

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| | **Application No.** | | **Applicant(s)** |
| **Office Action Summary** | 09/888,890 | | HARKIN, PATRICK A. |
| | **Examiner** | | **Art Unit** |
| | Antonio A Caschera | | 2676 |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *10 February 2004*.

2a)☐ This action is **FINAL**.     2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-68* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-38,40-47,49-55,57,59-66 and 68* is/are rejected.

7)☒ Claim(s) *39,48,56,58 and 67* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 August 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All    b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1.      Receipt is acknowledged of a request for continued examination under 37 CFR 1.114,

including the fee set forth in 37 CFR 1.17(e) and a submission, filed on 2/10/2004.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

2.      Claims 1-34, 49, 50, 53-55 and 57 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Takeda et al. (U.S. Patent 5,748,198) in view of Landau et al. (U.S. Patent

6,529,207 B1).

In reference to claims 1 and 9, Takeda et al. discloses a method and apparatus for

simulating three-dimensional objects using polygon data where an input polygon is determined

to be either front or back facing (see lines 1-2 and 7-10 of abstract). Takeda et al. discloses

sorting three-dimensional viewpoint coordinates, that have at least three vertices, making up

objects such as a race car and a race track (see columns 16-17, lines 66-10 and #226 of Figure

17B). Takeda et al. also discloses setting a back determination flag depending upon the

orientation of polygon vertex coordinates (see column 8, lines 46-65). Note the office interprets

the back determination flag functionally equivalent to applicant's orientation decision variable.

Although Takeda et al. discloses calculating a vector product of vertex coordinates (see column 8, lines 62-63), Takeda et al. does not explicitly disclose calculating a cross product term of a polygon however Landau et al. does. Landau et al. discloses a system used to identify objects to apply anti-aliasing determining whether a first primitive edge is hidden by other primitive edges (see lines 1-6 and 15-19 of abstract). Landau et al. discloses implementing back-face culling by computing an area of a triangle by the cross-product of the x and y projections of the triangle sides (see columns 5-6, lines 67-3). Landau et al. does not explicitly disclose calculating the cross-product term after having sorted the polygon data however it would have been obvious to one of ordinary skill in the art at the time the invention was made to sort the data before computing a cross-product term on the data in order to ensure the order of processing and polygon data remain constant making certain cross-product calculations will not yield incorrect signed data, which would ultimately lead to an incorrect determination of whether the polygon needs to be culled. It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the three-dimensional graphics simulation system of Takeda et al. with the back-face culling system of Landau et al. in order to render only front-face polygons reducing the amount of computation processing necessary for image synthesis (see column 2, lines 2-8 of Takeda et al.).

In reference to claims 2 and 10, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claims 1 and 9 respectively above in addition, Landau et al. discloses determining the sign of the cross-product calculation (see column 6, lines 3-11).

In reference to claims 3 and 11, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claims 2 and 10 respectively above in addition, Landau et al. discloses

evaluating the sign of the cross-product calculation to determine whether to cull the polygons

prior to rendering (see column 6, lines 3-26). It would have been obvious to one of ordinary skill

in the art at the time the invention was made to utilize the back determination flag of Takeda et

al. in conjunction with the sign evaluation disclosed by Landau et al. to determine whether

culling is needed in order to compare polygons in all directions, utilizing the back determination

flag to evaluate a Z direction (see column 8, lines 46-65 of Takeda et al.) and the sign of a cross-

product calculation to evaluate X and Y directions (see columns 5-6, lines 67-12 of Landau et

al.), when performing back-face culling.

In reference to claims 4 and 12, Takeda et al. and Landau et al. disclose all of the claim

limitations as applied to claims 3 and 11 respectively above in addition, Landau et al. discloses

comparing the sign of a cross-product calculation, indicating the direction of rendering, to an

actual orientation or direction of a polygon (see column 6, lines 3-11).

In reference to claims 5, 13, 23 and 32, Takeda et al. and Landau et al. disclose all of the

claim limitations as applied to claims 1, 9, 17 and 26 respectively. Landau et al. discloses using

the cross-product calculation to determine the direction of rendering of the triangle or whether

the triangle should be culled (see column 6, lines 3-27). Note the office interprets the

determining of whether the triangle should or should not be culled to be equivalent to an

appearance characteristic as claimed by the applicant as one characteristic of an image is whether

it is visible or not.

In reference to claims 6 and 14, Takeda et al. and Landau et al. disclose all of the claim

limitations as applied to claims 1 and 9 respectively above. Neither Takeda et al. nor Landau et

al. explicitly disclose sorting and generating an orientation decision variable substantially

concurrently however the office believes such a limitation to be a matter of design choice as preferred by the designer.  Further, the generating of the orientation decision variable may be executed following the sorting of polygon vertices, as the variable depends upon sorted vertex positions (see claim 7) therefore, the exact timing of concurrently sorting and generating provides no criticality to the system, as seen by the office, when viewing the system as a whole, as the system must wait for at least some vertices to be sorted in order to generate an accurate orientation decision variable.

In reference to claims 7 and 15, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claims 1 and 9 respectively above.  Neither Takeda et al. nor Landau et al. explicitly disclose generating the orientation decision variable based on the sorted polygon data however it would have been obvious to one of ordinary skill in the art at the time the invention was made base the orientation decision variable upon sorted data in order to ensure the orientation decision variable represents an accurate/sorted orientation of the polygon vertices to be decided for culling.

In reference to claims 8 and 16, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claims 7 and 15 respectively above in addition, Landau et al. discloses setting an orientation flag indicating the direction of a polygon, determined from the sign of a cross-product calculation and an actual orientation of the polygon (see column 6, lines 3-27).

In reference to claims 17 and 26, Takeda et al. discloses a method and apparatus for simulating three-dimensional objects using polygon data where an input polygon is determined to be either front or back facing (see lines 1-2 and 7-10 of abstract).  Takeda et al. discloses sorting three-dimensional viewpoint coordinates, that have at least three vertices, making up

objects such as a race car and a race track (see columns 16-17, lines 66-10 and #226 of Figure

17B) using a sorting logic block (see #226 of Figure 17B). Takeda et al. also discloses a back-

and-front determination logic block used to generate a back determination flag which the office

sees as functionally equivalent to applicant's orientation decision variable (see column 8, lines

46-50 and #408 of Figure 1A). Note the office interprets the back determination flag

functionally equivalent to applicant's orientation decision variable. Although Takeda et al.

discloses calculating a vector product of vertex coordinates (see column 8, lines 62-63), Takeda

et al. does not explicitly disclose calculating a cross product term of a polygon however Landau

et al. does. Landau et al. discloses a system used to identify objects to apply anti-aliasing

determining whether a first primitive edge is hidden by other primitive edges (see lines 1-6 and

15-19 of abstract). Landau et al. discloses the back-face culling determination, which includes

the cross-product calculation, to be executed by a culling module (see column 8, lines 47-50 and

#164 of Figure 12). Landau et al. discloses implementing back-face culling by computing an

area of a triangle by the cross-product of the x and y projections of the triangle sides (see

columns 5-6, lines 67-3). Landau et al. does not explicitly disclose calculating the cross-product

term after having sorted the polygon data however it would have been obvious to one of ordinary

skill in the art at the time the invention was made to sort the data before computing a cross-

product term on the data in order to ensure the order of processing and polygon data remain

constant making certain cross-product calculations will not yield incorrect signed data, which

would ultimately lead to an incorrect determination of whether the polygon needs to be culled. It

would have been obvious to one of ordinary skill in the art at the time the invention was made to

implement the three-dimensional graphics simulation system of Takeda et al. with the back-face

culling system of Landau et al. in order to render only front-face polygons reducing the amount

of computation processing necessary for image synthesis (see column 2, lines 2-8 of Takeda et

al.).

In reference to claims 18 and 27, Takeda et al. and Landau et al. disclose all of the claim

limitations as applied to claims 17 and 26 respectively above in addition, Takeda et al. discloses

the sorting and back-and-front determination logic blocks being under the control of a three-

dimensional graphics simulator which performs back-face culling (see lines 1-10 of abstract).

Landau et al. discloses the culling module being under the control of a graphics rendering system

which performs back-face culling (see column 5, lines 56-59). It would have been obvious to

one of ordinary skill in the art at the time the invention was made to implement the logic blocks

of Takeda et al. with the culling module of Landau et al. in order to reduce the amount of

computation processing necessary for image synthesis (see column 2, lines 2-8 of Takeda et al.).

In reference to claims 19 and 28, Takeda et al. and Landau et al. disclose all of the claim

limitations as applied to claims 17 and 26 respectively above. Although Landau et al. discloses a

graphics rendering system comprising a processor which controls the culling module (see

column 3, lines 44-45 and Figure 12), neither Takeda et al. nor Landau et al. explicitly disclose

the logic blocks part of a computer processor however, the office sees such a limitation as a

matter of design choice as preferred by the designer. Further, it is well known in the art to

implement graphics processing, performing graphics manipulations including culling, in graphics

processors/adapters.

In reference to claims 20 and 29, Takeda et al. and Landau et al. disclose all of the claim

limitations as applied to claims 17 and 26 respectively above. Although Landau et al. discloses

the third logic block, the culling module, to determine back-face culled triangles which includes

determining the sign of the cross-product term (see columns 5-6, lines 67-27 and column 8, lines

25-28), neither Takeda et al. nor Landau et al. explicitly disclose a fourth logic block

determining the sign of the cross-product term however, the office sees such a limitation as a

matter of design choice as preferred by the designer. Further, creating a separate logic block to

determine the sign of the cross-product calculation instead of incorporating the sign

determination in the third logic block (cross-product calculation) provides no immediate

criticality to the system when viewing it as a whole.

In reference to claims 21 and 30, Takeda et al. and Landau et al. disclose all of the claim

limitations as applied to claims 20 and 26 respectively. Claims 21 and 30 are equivalent in scope

to claim 4 and therefore are rejected under equivalent rationale in addition, neither Takeda et al.

nor Landau et al. explicitly disclose a fifth logic block determining an orientation of a polygon

based on the sign of the cross-product term and the orientation decision variable however, the

office sees such a limitation as a matter of design choice as preferred by the designer. Further,

creating a separate logic block to determine an orientation of a polygon instead of incorporating

it into the third logic block (cross-product calculation) provides no immediate criticality to the

system when viewing the system as a whole.

In reference to claims 22 and 31, Takeda et al. and Landau et al. disclose all of the claim

limitations as applied to claims 21 and 30 respectively above. Claims 22 and 31 are equivalent

in scope to claim 3 and therefore are rejected under equivalent rationale.

In reference to claims 24 and 33, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claims 17 and 26 respectively above. Claims 24 and 33 are equivalent in scope to claim 6 and therefore are rejected under equivalent rationale.

In reference to claims 25 and 34, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claims 17 and 26 respectively above. Neither Takeda et al. nor Landau et al. explicitly disclose the first and second logic circuits to comprise the same logic circuit however, the office sees such a limitation as a matter of design choice as preferred by the designer. Further, the exact configuration of hardware within the system provides no immediate criticality towards the system as it is view as a whole. Also, it is well known in the art to incorporate several logic blocks together on a single chip, for example, to same physical space for other hardware.

In reference to claim 49, Takeda et al. discloses a method and apparatus for simulating three-dimensional objects using polygon data where an input polygon is determined to be either front or back facing (see lines 1-2 and 7-10 of abstract). Takeda et al. discloses sorting three-dimensional viewpoint coordinates, that have at least three vertices, making up objects such as a race car and a race track (see columns 16-17, lines 66-10 and #226 of Figure 17B). Takeda et al. also discloses setting a back determination flag depending upon the orientation of polygon vertex coordinates (see column 8, lines 46-65). Note the office interprets the back determination flag functionally equivalent to applicant's orientation decision variable. Although Takeda et al. discloses calculating a vector product of vertex coordinates (see column 8, lines 62-63), Takeda et al. does not explicitly disclose calculating a cross product term of a polygon however Landau et al. does. Landau et al. discloses a system used to identify objects to apply anti-aliasing

determining whether a first primitive edge is hidden by other primitive edges (see lines 1-6 and

15-19 of abstract). Landau et al. discloses implementing back-face culling by computing an area

of a triangle by the cross-product of the x and y projections of the triangle sides (see columns 5-

6, lines 67-3). Landau et al. does not explicitly disclose determining whether the polygon is

front or back facing based on a sorted order of vertices however, it would have been obvious to

one of ordinary skill in the art at the time the invention was made to determine if culling was

needed based upon sorted polygon data in order to perform an accurate evaluation of the position

of vertices when comparing the sign of the cross product calculation found using the polygon

vertex data. It would have been obvious to one of ordinary skill in the art at the time the

invention was made to implement the three-dimensional graphics simulation system of Takeda et

al. with the back-face culling system of Landau et al. in order to render only front-face polygons

reducing the amount of computation processing necessary for image synthesis (see column 2,

lines 2-8 of Takeda et al.).

In reference to claim 50, Takeda et al. and Landau et al. disclose all of the claim

limitations as applied to claim 49 above in addition, Takeda et al. discloses sorting polygon

viewpoint coordinates in the Z-axis direction (see column 17, lines 4-10).

In reference to claim 53, Takeda et al. and Landau et al. disclose all of the claim

limitations as applied to claim 49 above. Claim 53 is equivalent in scope to claim 7 and

therefore is rejected under equivalent rationale.

In reference to claim 54 Takeda et al. and Landau et al. disclose all of the claim

limitations as applied to claim 53 above. Claim 54 is equivalent in scope to claim 6 and

therefore is rejected under equivalent rationale.

In reference to claim 55, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claim 53 above. Neither Takeda et al. nor Landau et al. explicitly disclose generating an orientation decision variable following sorting the polygon data however the office believes such a limitation to be a matter of design choice as preferred by the designer. Further, the generating of the orientation decision variable may be executed following the sorting of polygon vertices, as the variable depends upon sorted vertex positions (see claim 7) therefore, the exact timing of sorting and generating provides no criticality to the system, as seen by the office, when viewing the system as a whole, as the system must wait for at least some vertices to be sorted in order to generate an accurate orientation decision variable.

In reference to claim 57, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claim 49 above in addition, Landau et al. discloses determining whether a polygon is back-face culled by evaluating the orientation (clockwise or counterclockwise) of the polygon to an actual orientation of the polygon (see columns 5-6, 67-27).

3.       Claims 35-38, 40-47, 51, 52, 59-66 and 68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeda et al. (U.S. Patent 5,748,198), Landau et al. (U.S. Patent 6,529,207 B1) and further in view of Baltaretu et al. (U.S. Patent 6,437,780 B1).

In reference to claim 35, Takeda et al. discloses a method and apparatus for simulating three-dimensional objects using polygon data where an input polygon is determined to be either front or back facing (see lines 1-2 and 7-10 of abstract). Takeda et al. discloses sorting three-dimensional viewpoint coordinates, that have at least three vertices, making up objects such as a race car and a race track (see columns 16-17, lines 66-10 and #226 of Figure 17B). Takeda et al. also discloses setting a back determination flag depending upon the orientation of polygon vertex

coordinates (see column 8, lines 46-65). Note the office interprets the back determination flag functionally equivalent to applicant's orientation decision variable. Although Takeda et al. discloses calculating a vector product of vertex coordinates (see column 8, lines 62-63), Takeda et al. does not explicitly disclose calculating a cross product term of a polygon however Landau et al. does. Landau et al. discloses a system used to identify objects to apply anti-aliasing determining whether a first primitive edge is hidden by other primitive edges (see lines 1-6 and 15-19 of abstract). Landau et al. discloses implementing back-face culling by computing an area of a triangle by the cross-product of the x and y projections of the triangle sides (see columns 5-6, lines 67-3). Neither Takeda et al. nor Landau et al. explicitly disclose determining positional differences between adjacent vertices of a polygon however Baltaretu et al. does. Baltaretu et al. discloses a graphics system wherein rectangular areas are determined covered by polygons (see column 2, lines 57-61). Baltaretu et al. discloses a delta calculator within a vertex tiler that computes the differences between x and y coordinates of three adjacent vertices of a polygon (see column 17, lines 20-24). Baltaretu et al. also discloses that the vertex tiler receives three vertices of a triangle, one at a time from a FIFO memory via a vertex bus (see column 17, lines 8-14). Since, the vertex tiler receives the vertex data in such a structured manner, three vertices per triangle, one triangle at a time, the office interprets Baltaretu et al. inherently discloses sorting data representative of the three vertices of a polygon since the vertices are received being grouped together, forming a triangle. It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the three-dimensional graphics simulation system of Takeda et al. and the back-face culling system of Landau et al. with the positional difference calculation and sorting of graphics data of Baltaretu et al. in order to better determine

if the vertices were received, by the rendering system, in a certain order by sorting the vertices

eliminating the need to check for culling located outside the projection of the polygon in the

scanning direction (see columns 9-10, lines 65-1 of Baltaretu et al.).

In reference to claim 36, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 35 above in addition, Landau et al. discloses utilizing the

positional differences in a vertex-to-tile translator which converts vertex coordinates to create

tiles (see column 18, lines 25-47). Note the office interprets the formation of tiles from vertex

coordinates an alternate rendering operation.

In reference to claim 37, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 35 above. Claim 37 is equivalent in scope to claim 2 and

therefore is rejected under equivalent rationale.

In reference to claim 38, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 37 above in addition, Baltaretu et al. discloses evaluating

the sign of a cross-product calculation based on sorted data (see column 17, lines 28-35 and #311

and 331 of Figure 3C).

In reference to claim 40, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 38 above in addition, Landau et al. discloses comparing the

sign of the cross-product calculation with an actual orientation of a triangle leaving the sign of

the cross product calculation unchanged (see column 6, lines 3-27).

In reference to claim 41, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 37 above in addition, Landau et al. discloses comparing the

sign of the cross product calculation with an actual orientation of a triangle to see if the rendering

orientation of the triangle has been changed (see column 6, lines 3-27).

In reference to claim 42, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 35 above in addition, Takeda et al. discloses sorting

polygon viewpoint coordinates in the Z-axis direction (see column 17, lines 4-10).

In reference to claim 43, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 42 above in addition, Baltaretu et al. discloses sorting the

vertices of polygons from top to bottom, comparing y coordinate delta values (see column 18,

lines 15-25).

In reference to claim 44, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 43 above in addition, Baltaretu et al. discloses sorting the

vertices of polygons from left to right, comparing x coordinates (see column 17, lines 47-56).

In reference to claim 45, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 35 above. Takeda et al. also discloses setting a back

determination flag depending upon the orientation of polygon vertex coordinates (see column 8,

lines 46-65). Note the office interprets the back determination flag functionally equivalent to

applicant's orientation decision variable.

In reference to claim 46, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 45 above. Claim 46 is equivalent in scope to claim 6 and

therefore is rejected under equivalent rationale.

In reference to claim 47, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 45 above. Neither Takeda et al., Landau et al. nor Baltaretu

et al. explicitly disclose generating an orientation decision variable following sorting the polygon

data however the office believes such a limitation to be a matter of design choice as preferred by

the designer. Further, the generating of the orientation decision variable may be executed

following the sorting of polygon vertices, as the variable depends upon sorted vertex positions

(see claim 7) therefore, the exact timing of sorting and generating provides no criticality to the

system, as seen by the office, when viewing the system as a whole, as the system must wait for at

least some vertices to be sorted in order to generate an accurate orientation decision variable.

In reference to claim 51, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 50. Neither Takeda et al. nor Landau et al. explicitly

disclose sorting the polygon data based on horizontal positions however Baltaretu et al. does.

Baltaretu et al. discloses sorting the vertices of polygons from top to bottom, comparing y

coordinate delta values (see column 18, lines 15-25). It would have been obvious to one of

ordinary skill in the art at the time the invention was made to sort the polygon data in order to

better determine if the vertices were received, by the rendering system, in a certain order by

sorting the vertices eliminating the need to check for culling located outside the projection of the

polygon in the scanning direction (see columns 9-10, lines 65-1 of Baltaretu et al.).

In reference to claim 52, Takeda et al. and Landau et al. disclose all of the claim

limitations as applied to claim 51 above. Neither Takeda et al. nor Landau et al. explicitly

disclose sorting the polygon data based on horizontal positions however Baltaretu et al. does.

Baltaretu et al. discloses sorting the vertices of polygons from left to right, comparing x

coordinates (see column 17, lines 47-56). It would have been obvious to one of ordinary skill in

the art at the time the invention was made to sort the polygon data in order to better determine if

the vertices were received, by the rendering system, in a certain order by sorting the vertices

eliminating the need to check for culling located outside the projection of the polygon in the

scanning direction (see columns 9-10, lines 65-1 of Baltaretu et al.).

In reference to claim 59, claim 59 is equivalent in scope to claim 35 and therefore is

rejected under equivalent rationale in addition, Landau et al. also discloses back-face culling

polygons based upon a comparison of the sign of a cross-product calculation and an actual

orientation of a polygon to see if both indicate a common orientation (clockwise and

counterclockwise) (see columns 5-6, lines 67-27).

In reference to claim 60, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 59 above. Landau et al. discloses determining whether a

polygon is back-face culled by evaluating the orientation (clockwise or counterclockwise) of the

polygon to an actual orientation of the polygon (see columns 5-6, 67-27).

In reference to claim 61, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 60 above. Landau et al. discloses determining whether a

polygon is back-face culled by evaluating the orientation (clockwise or counterclockwise) of the

polygon to an actual orientation of the polygon to see if they indicate a common or opposite

orientation (see columns 5-6, 67-27).

In reference to claim 62, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 61 above. Claim 62 is equivalent in scope to claim 43 and

therefore is rejected under equivalent rationale.

In reference to claim 63, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 62 above. Claim 63 is equivalent in scope to claim 44 and therefore is rejected under equivalent rationale.

In reference to claim 64, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 59 above. Takeda et al. also discloses setting a back determination flag depending upon the orientation of polygon vertex coordinates (see column 8, lines 46-65). Note the office interprets the back determination flag functionally equivalent to applicant's orientation decision variable.

In reference to claim 65, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 64 above. Neither Takeda et al., Landau et al. nor Baltaretu et al. explicitly disclose calculating a cross-product term based on the sorted polygon data however it would have been obvious to one of ordinary skill in the art at the time the invention was made to base the cross-product calculation upon sorted data in order to ensure the yield of the calculation represents an accurate orientation of the polygon vertices to be decided for culling since the determination of whether to cull is based, in part, upon the sign of the cross-product calculation.

In reference to claim 66, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 65 above. Claim 66 is equivalent in scope to claim 2 and therefore is rejected under equivalent rationale.

In reference to claim 68, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 59 above. Claim 68 is equivalent in scope to claim 5 and therefore is rejected under equivalent rationale.

## *Response to Arguments*

4.      Applicant's arguments filed 1/16/2004 have been fully considered but they are not

persuasive.

In response to applicant's argument that there is no suggestion to combine the references,

the examiner recognizes that obviousness can only be established by combining or modifying the

teachings of the prior art to produce the claimed invention where there is some teaching,

suggestion, or motivation to do so found either in the references themselves or in the knowledge

generally available to one of ordinary skill in the art.  See *In re Fine*, 837 F.2d 1071, 5

USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir.

1992).  In this case, both Takeda et al. and Landau et al. disclose systems directed towards

producing three-dimensional objects from polygon data which determine data hidden from a

viewable point (see abstracts of Takeda et al. and Landau et al.).  Similarly, both references deal

with backface culling and calculating some type of product to determine polygon orientation (see

column 8, lines 46-64 of Takeda et al. and columns 5-6, lines 67-17 of Landau et al.).  Therefore,

the office interprets the motivation to combine the polygon data processing techniques used in

Takeda et al. with the back-face culling system of Landau et al. in order to implement a system

utilizing the above techniques to render only front-face polygons, rather than those which are

hidden from view, reducing the amount of computation processing necessary for image synthesis

(see column 2, lines 2-8 of Takeda et al.) thus improving processing efficiency and conserving

system costs.  The motivation to further combine Baltaretu et al. with the above references is

directed towards the sorting of vertex data.  Baltaretu et al. discloses eliminating the need to

check tiles that are to the left of the left most vertex and the right of the right most vertex by

sorting (see column 10, lines 1-5) which again, leads to the reduced amount of computation

processing necessary for image synthesis thus improving processing efficiency and conserving

system costs.

Further, the applicant repeatedly argues, in reference to the independent claims, that

neither Takeda et al., Landau et al. nor, Baltaretu et al. explicitly disclose sorting the data of the

at least three vertices of a polygon prior to determining the cross product term or determining the

orientation of the polygon based on the sorted data (see one instance, page 7, 3rd paragraph of

Applicant's Remarks). The office interprets all data input into a calculation sorted or arranged in

some way. Some order must be followed in utilizing the data for performing calculations. The

independent claims do not explicitly disclose the rearrangement of already ordered data input

into the system therefore the office interprets the data input in the system, to be processed in

some manner, already in a certain order as called upon by the system. The data utilized in the

vector product and cross product calculations of Takeda et al. and Landau et al., respectively, is

therefore sorted, as interpreted by the office. The applicant also argues that neither Takeda nor

Landau, "...teach or suggest an affirmative arrangement of data other than the order assigned to

the data..." based on the definition of the term, "sort" (see page 6, 3rd paragraph of Applicant's

Remarks). The office disagrees as Landau discloses compiling an edge vertex list which consists

of vertices of polygons which are stored according to their arrangement relationship between one

another (see Figure 10). Such a stored relationship is interpreted as a sorted arrangment, by the

office.

Even further, the applicant argues Takeda lacks any teaching or suggestion of culling

back facing polygons (see page 3, 2nd paragraph of Applicant's Remarks) however Landau does.

Landau et al. discloses implementing back-face culling by computing an area of a triangle by the

cross-product of the x and y projections of the triangle sides (see columns 5-6, lines 67-3). The

office also notes that the many of the independent claims do not specifically claim culling, for

example, claim 1 soley states, "generating an orientation decision vairable based on relative

positions of said at least three vertices..." which the office does not interpret as actually

performing culling operations.

5.      Applicant's arguments with respect to claims 35-38, 40-47, 51, 52, 59-66 and 68 have

been considered but are moot in view of the new ground(s) of rejection.


### *Allowable Subject Matter*

6.      Claims 39, 48, 56, 58 and 67 are objected to as being dependent upon a rejected base

claim, but would be allowable if rewritten in independent form including all of the limitations of

the base claim and any intervening claims.

In reference to claim 39, the prior art of record (Takeda et al. (U.S. Patent 5,748,198),

Landau et al. (U.S. Patent 6,529,207 B1) and Baltaretu et al. (U.S. Patent 6,437,780 B1)) does

not disclose changing the sign of a cross-product term in combination with further claim

limitations of claim 38 from which claim 39 claims dependency.

In reference to claim 48, the prior art of record (Takeda et al. (U.S. Patent 5,748,198),

Landau et al. (U.S. Patent 6,529,207 B1) and Baltaretu et al. (U.S. Patent 6,437,780 B1)) does

not disclose evaluating the orientation decision variable when evaluating the sorted order of

polygon data in combination with further claim limitations of claim 45 from which claim 48

claims dependency.

In reference to claim 56, the prior art of record (Takeda et al. (U.S. Patent 5,748,198),

Landau et al. (U.S. Patent 6,529,207 B1) and Baltaretu et al. (U.S. Patent 6,437,780 B1)) does

not disclose determining whether a polygon is front or back facing based at least in part on the

sorted order of at least three vertices comprises considering the orientation decision variable, in

combination with further claim limitations as of claim 53 from which claim 56 claims

dependency.

In reference to claim 58, claim 58 is objected to as being dependent upon objected claim

56 from which claim 58 claims dependency.

In reference to claim 67, the prior art of record (Takeda et al. (U.S. Patent 5,748,198),

Landau et al. (U.S. Patent 6,529,207 B1) and Baltaretu et al. (U.S. Patent 6,437,780 B1)) does

not disclose determining whether a polygon's orientation has changed evaluating the sign of a

cross-product calculation and an orientation decision variable, in combination with further claim

limitations of claim 66 from which claim 67 claims dependency.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Antonio Caschera whose telephone number is (703) 305-1391.

The examiner can normally be reached Monday-Thursday and alternate Fridays between 7:00

AM and 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Matthew Bella, can be reached at (703)-308-6829.

**Any response to this action should be mailed to:**

Commissioner of Patents and Trademarks
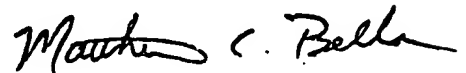
Washington, D.C. 20231

**or faxed to:**

**(703) 872-9314 (for Technology Center 2600 only)**

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive,

Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding

should be directed to the Technology Center 2600 Customer Service Office whose telephone

number is (703) 306-0377.

aac

3/24/04

MATTHEW C. BELLA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600